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APPLICANT : PIONEER ELECTRON CORP;

INVENTOR : OGASAWARA MASAKAZU;

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TITLE : OBJECTIVE LENS

$$V(r_1, r_2, A_{21}, \Delta 1, C) = \sqrt{2\int_0^{r_1}(W(r)+C)^2 r\,dr + 2\int_{r_1}^{r_2}\{2\Delta 1(W(r)+C)+\Delta 1^2\}r\,dr}$$

$$W(r) = A_{63}(20r^6-30r^4+12r^2-1)+A_{42}(6r^4-6r^2+1)+A_{21}(2r^2-1)$$

ABSTRACT : PROBLEM TO BE SOLVED: To suppress a spherical aberration at a CD reproducing time without sacrificing the reproducing characteristic of a DVD by providing a specified ring-belt-like recessed part around an optical axis on the diffraction surface of an objective lens.

SOLUTION: The objective lens is provided with a diffraction surface rotary symmetrical to an optical axis. A part of this diffraction surface is displaced along the optical axis as a ring-belt-like recessed part around the optical axis. Then, the ring-belt-like recessed part is the objective lens that an RMS aberration V satisfying an equation is provided with r_1 and r_2 becoming values in the vicinity of a minimum value when $VdV/d(A_{21})=0$, $dV/d(\Delta 1)=0$, $dV/dc=0$. Where, (r) shows a radius from the optical axis, A_{63} shows a guinitic spherical aberration coefficient, A_{42} shows a tertiary spherical aberration coefficient, A_{21} shows a defocus aberration coefficient, (c) shows a wave front offset, $\Delta 1$ shows $\Delta h/(n-1)$, (n) shows a refractive index of an objective lens material, r_1 shows NA_{in}/NA_0, r_2 shows NA_{out}/NA_0, NA_0, shows the diameter of a second numerical aperture, NA_{out} shows the diameter of an are corresponding to an outside diameter numerical aperture and NA_{in} shows the diameter of an area corresponding to an internal diameter numerical aperture.